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Do metaphoric gestures influence how a message is perceived? The effects of metaphoric gesture-speech matches and mismatches on semantic communication and social judgment

Abstract: Considerable evidence has demonstrated that people are not only sensitive to the information contained in concrete imagistic gesture, but furthermore, that they combine this gestural information with the accompanying speech in order to understand the full semantic meaning that a speaker conveys in a message. There is, however, very little experimental evidence concerning how people deal with more abstract metaphoric gestures and whether they extract meaning from these gestures and combine this with the information in the accompanying speech. The two studies reported here investigated this issue by comparing and contrasting the effects of metaphoric gesture-speech matches and mismatches on both semantic communication and social judgment. The studies found that individuals do combine the information contained in metaphoric gestures with that contained in speech and that the meaning of the utterance is demonstrably affected by the presence of a gesture-speech mismatch. The second study found that in messages in which there are gesture-speech mismatches, participants seemed to like the speaker less and were less likely to believe what they said. The implications of these studies for a range of domains, including advertising and politics, are discussed.

Keywords: co-verbal gestures; metaphor; gesture-speech mismatches; speech comprehension; talk

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1 Introduction

It may seem surprising considering the research attention now placed on the imagistic gestures that people generate unconsciously during speech production, that until quite recently, the traditional view regarding such gestures was that they constituted a system very much secondary to speech, and we lacked any clear understanding of their function or purpose (see Kendon 2004 for an overview). The transformation of the way in which gestures are viewed began with the pioneering and influential work of David McNeill (1985). Through his research, McNeill (1985) highlighted the role of gesture in conveying semantic information and he argued persuasively that in everyday communication such gestures are an integral part of the process and are as significant as speech itself. In terms of the communication of semantic information, the gestural channel habitually provides critical information additional to that conveyed in speech. Consequently, it is only when the two channels are combined that the full message of the speaker is successfully conveyed (Beattie 2003).

A highly cited example from McNeill (1992: 13) outlines the basic principles underlying this multi-modal semantic communication:

"she chases [him out again]"
Iconic: hand gripping an object swings from left to right.

What this example, from a cartoon narration, reveals is that within the speech itself there are details of the "action" (chasing), "the characters involved" (she/him) and "the concept of recurrence" (again), yet there is no mention verbally of any weapon being used in the pursuit. However, the gesture used alongside the speech portrays the weapon being brandished and communicates effectively why one character is running from another. While the speech and gesture in this example are obviously connected in terms of their semantic content, they are not identical. In this way, the gesture is said to be "complementary" to speech in that it adds additional information (McNeill and Duncan 2000). McNeill (2000: 139) would therefore argue that, "To exclude the gesture side, as has been traditional, is tantamount to ignoring half of the message out of the brain." The critical point is that the receiver attends to the speech alone, they may miss the critical additional information that is conveyed in the gestural channel.

Stemming from the initial research of McNeill, the role of gesture in communication has now been extensively studied and has consistently revealed that in order for the receiver to obtain the full semantic meaning of an utterance, both channels of communication need to be combined in order to form a more complete, overall representation of the message (Beattie and Shovelton 1999a, 1999b).

For example, Beattie and Shovelton (1999a), found that when participants were played narrated extracts of cartoon stories, there was a clear advantage to being presented with an extract containing speech accompanied by iconic gestures (a concrete form of imagistic gesture), as evidenced by the significant increase in the amount of information they gained compared to participants who were only presented with a speech extract. From these studies it became clear that not only do imagistic gestures encode critical information, but also that receivers are able to decode this information successfully and combine it with the information encoded in speech. This theoretical perspective has clear implications for understanding communication more generally. For example, if significant semantic information is naturally split between the speech and the gestural channels, is it most effective to communicate semantic information using both channels? Beattie and Shovelton (2005) applied this theoretical perspective to television advertising in which two characters talked about a new fruit drink "F" ("with your five portions of fruit in one tiny little drink"). They found that the use of both speech and imagistic gesture (including both a concrete iconic gesture and metaphoric gestures) were more effective in highlighting the core semantic features of the product (the "size" of the bottle, the "freshness" of the fruit in the drink and the fact that it was designed for "everyone") than speech alone. Specifically, by combining imagistic gesture and speech, participants gained 40.7% additional information than when speech was presented alone.

Although it is now clear that people are in fact sensitive to the information contained in concrete iconic gestures, it remains to be seen whether people are sensitive to the information contained in other gestural forms, particularly more abstract metaphoric gestures. Given that metaphoric gestures are used to represent abstract concepts, one might expect the information encoded within them to be somewhat difficult to interpret. Can people interpret metaphoric gestures as successfully as more concrete imagistic gestures? Furthermore, although it is clear that people are sensitive to the information conveyed in complementary gestures, it is not clear whether the same rule applies to gestures that do not complement concurrent speech. What happens, for example, when the information encoded in the gesture appears to contradict what is being said verbally? Indeed, in certain everyday situations, there are times when the speech and gesture channels do appear to contradict one another, known within the psychological literature as a "mismatch" (Church and Goldin-Meadow 1986). Mismatches may occur for a variety of reasons. It has been argued that they may occur when a speaker is trying to conceal critical information from a listener (see Cohen et al. 2010). The basic hypothesis here is that while speech can be edited (particularly in certain situations where the speaker may be trying to present a false idea or belief), spontaneous imagistic gestures are more difficult to change, therefore the true feelings

of the speaker may manifest in the gestural channel, revealing what they are actually thinking (Beattie 2003).

But how do people react to such gesture-speech mismatches? Intuitively, one might expect that if information can be extracted routinely from the gestural channel then it might follow that information will continue to be extracted from the gestural channel even when the speech and gesture do not match. But are people in any way sensitive to the apparent discrepancy between the two channels of communication? If inconsistent information can also be extracted from the gestural channel, then will this have any effect on how people interpret a given message? In the experimental paradigm used by Beattie and Shovelton, participants were often unsure of exactly where they obtained the critical semantic information, but it influenced their interpretation of a message nonetheless. On the other hand, if mismatches are ignored then so is the vital information the gestures convey, hence any judgments about the semantic content of an utterance will be entirely in line with the information conveyed in speech.

Turning to research within the psychological literature that has considered mismatching communications in general and gesture-speech mismatches in particular, we will first of all consider two sets of important and influential experiments into verbal-nonverbal conflict and their effects on individuals. The first set of experiments were carried out by Albert Mehrabian at the University of California in Los Angeles and were published in a number of studies in the late nineteen sixties (Mehrabian and Ferris 1967; Mehrabian and Wiener 1967). Here, Mehrabian investigated the effects of consistencies and inconsistencies in multi-modal communication between the various channels, including the actual meaning of the words (verbal channel), the tone of voice (vocal channel) and the accompanying facial expressions (facial channel), on the communication of interpersonal attitudes and, in particular, on judgments of degrees of liking. In the first study he carried out, he selected three words that were judged to convey liking – "honey" "thanks" and "dear," three words judged to be neutral in this regard – "maybe" "really" and "oh," and three words that conveyed dislike – "don't" "brute" and "terrible." Two female speakers read each of the nine selected words using positive, neutral, and negative vocal expressions and these communications were then played to sets of judges. In a second study, one neutral word was selected, the word "maybe," and this time the facial expression was varied to be either positive, neutral or negative. Judges in this second study were presented with an audio recording of the message and a photograph of the person delivering the message. The judges had to rate the overall communication to determine how positive or negative the speaker came across.

From these studies Mehrabian found that in the communication of interpersonal attitudes, the facial channel and the vocal channels greatly outweighed the

verbal channel. He estimated the relative contributions of the three channels as 55% for the facial channel, 38% for the vocal channel and 7% for the verbal channel. Mehrabian's conclusion was that, "when there is inconsistency between verbally and implicitly expressed attitudes, the implicit proportion [the nonverbal component] will dominate in determining the total message." This was the first study that attempted to demonstrate the individual contributions of the verbal and nonverbal channels in the communication of interpersonal attitudes.

While being highly provocative, these studies have a significant limitation in that they do not really consider *language* in the expression of interpersonal attitudes – at least not language as we normally understand it with meaningful sentences used to express how we feel – but used instead only individual words like "honey" "brute" and "maybe." In everyday conversation, people do not communicate using individual words for prolonged periods of time, therefore one might question whether these experiments are in any way representative of the judgments we make about people in real communicative encounters. In addition, when Mehrabian considered the effects of facial versus vocal cues, the two channels of communication were not presented in combination on a videotape (for example) but merely as a photograph of a facial expression accompanied by an audio recording of a single word. This meant that participants had to integrate the two channels by interpreting a still image of the facial expression and combine this with an audio recording in order to make their judgment, which again is at odds with how we communicate with people in the real world. In this way, it could be argued that the experimental design fails to simulate both normal social communication and normal social judgment. Hence, we should be careful in applying these findings to real world situations.

However, at first sight, two experiments later conducted at Oxford in the early nineteen seventies by Michael Argyle and his colleagues seem to address many of these issues. The experiments were published as Argyle et al. (1970; 1971). The basic methodology of these experiments is quite ingenious but it does require careful scrutiny. In brief, three verbal messages that were in the form of paragraphs rather than individual words (hostile, neutral or friendly in one experiment; superior, neutral or inferior in another) were delivered in three different nonverbal styles (the friendly style was described as having a "warm, soft tone of voice, open posture, smiling face" whereas the hostile style was described as having a "harsh voice, closed posture, frown with teeth showing"). The experimenters had been careful from the outset to ensure that the verbal message and the nonverbal style had approximately the same effects on listener evaluation on certain specific dimensions. Here is an example of a hostile message used in the experiment: "I don't much enjoy meeting the subjects who take part in these experiments. I often find them rather boring and difficult to deal with. Please

don't hang around too long afterwards and talk about the experiment. Some people who come as subjects are really rather disagreeable."

The combined communications, with the three verbal messages delivered in each of the three verbal styles, were then rated by judges to see how friendly or hostile the resultant messages were perceived. Again, the results appear to demonstrate quite clearly that the nonverbal channel greatly outweighed the verbal channel in the communication of interpersonal attitudes. For example, on a seven point scale, where 7 meant extremely friendly and 1 meant extremely hostile, the hostile verbal message delivered in a friendly nonverbal style was rated as 5.17. In other words, it was perceived as being towards the friendly end of the scale, and higher than the mid-point of 4. As such, when the nonverbal style was friendly, the actual *content* of the speech did not seem to have much of an impact on the overall communication as it was still perceived as friendly. Similarly, when the nonverbal style was hostile, again, it did not really seem to matter *what* was being said, but how the message was being communicated nonverbally. Indeed, the difference in perception of the friendly and hostile verbal messages delivered in the hostile nonverbal style was trivial, the scores being 1.60 and 1.80 respectively.

These results led Argyle to the conclusion that nonverbal communication was twelve and a half times more powerful than language in the communication of interpersonal attitudes on the hostile-friendly dimension and over ten times more powerful in the communication of interpersonal attitudes on the superior-inferior dimension.

Given that the figures placed on the importance of nonverbal communication by Argyle were very similar to those of Mehrabian, together, these studies gave those who wished to discuss the importance of nonverbal communication precise figures with which to work. Taken on face value, not only do they successfully demonstrate that nonverbal communication is an important channel of communication, but also they seem to imply that we can virtually dismiss verbal language if we really want to understand how interpersonal attitudes are signaled, and how interpersonal relations are built, in interpersonal communication. It also means that we can ignore the connections between language and nonverbal communication because, in Argyle's experiment, the judges seemed to do just that. But as with Mehrabian's research, these studies also have a number of fundamental weaknesses that significantly limit the conclusions that can be drawn from them. Firstly, in Argyle's experiments, the participants or "judges" were asked to watch a set of nine successive communications on videotape, all from the same person, in which the language and nonverbal communication was systematically varied. The "experimental manipulation" would, therefore, be immediately obvious to anyone who took part. As a result of these demand characteris-

tics, participants may alter their behavior in accordance with the experimenter's expectations.

Secondly, in order to try to measure the relative importance of language and nonverbal communication, the strength of the two channels had to be both measured and equated at the outset. Therefore these studies tell us, at best, about how people perceive a certain class of communications within the range of the component strengths artificially set. What the studies do not tell us, of course, is anything about the range of effects produced by language and nonverbal communication in the world at large. Perhaps in the real world people do not use such explicitly friendly or unfriendly messages. Consider the hostile verbal statement that was used, "I don't much enjoy meeting the subjects who take part in these experiments. I often find them rather boring and difficult to deal with." Is this statement likely to be said directly to someone, other than as a joke? Additionally, when the statement is accompanied by a friendly verbal style ("warm, soft tone of voice, smile, open posture"), how else is this supposed to be interpreted and understood apart from as a joke or ironic comment which would (in all likelihood) lead to the verbal channel being dismissed? So, while these studies present us with an intriguing picture, it is hardly a complete one. And, additionally, they tell us very little directly about the effects of gesture-speech mismatches.

One of the few studies to have studied actual gesture-speech mismatches was conducted by Cassell et al. (1999). Here, staged mismatches between speech and gesture were employed as a medium through which to investigate the communicative effectiveness of iconic gestures. The fundamental rationale underpinning the study was that if a speaker's full meaning is conveyed not simply through the vocal channel, but by a combination of speech and gesture, then one might expect that while the verbal component of the message will claim the listener's principal attention, the gesture may nevertheless significantly affect the information that is acquired. The participants in this experiment believed they were watching another participant describing a cartoon. In fact three types of mismatches were introduced into a confederate's narrative. The results showed that gestural messages that mismatched the information contained in the accompanying speech were often represented in listeners" subsequent re-telling of the narrative. Given that information was extracted from the gestural channel, even where speech and gesture did not match, not only does this study demonstrate that mismatches are communicative; it also demonstrates that when presented with a mismatch, the information conveyed in the gestural channel can alter the entire underlying representation of the utterance (Cassell et al. 1999).

However, there is a limitation with this experiment given its overly restrictive focus. Specifically, the only gesture categories considered were anaphor, origo, and manner mismatches. Anaphor mismatches refer back to someone or some-

thing but point to the wrong part of the gestural space where it had been located previously, origo mismatches change the perspective that the action is seen from, and manner mismatches provide different information regarding how a particular action was performed (Cassell et al. 1999). Clearly, these specific examples of iconic gestures form only a subset of the gestures that appear in naturally occurring communications. It has been suggested by Beattie (2003) that metaphoric gestures are, in fact, much more common in everyday communication, despite being highly abstract and therefore somewhat difficult to interpret given their lack of a defined lexicon. Given this, it is important that we extend previous research findings to explore how recipients might respond when faced with gesture-speech mismatches with a metaphoric nature.

This forms the basis for a series of experiments in which we construct plausible messages using naturally observed gesture-speech matches/mismatches to determine if the degree of congruence between the two channels has an effect on the specific message received by the participants and on subsequent social judgments made about the speaker. We test two hypotheses with quite different predictions. One hypothesis is that participants will integrate information from both the speech and gestural channel, even when the information conveyed in the gestural channel is abstract (as in metaphoric gestures) and, additionally, when it does not match that contained within the speech. In contrast, the second hypothesis asserts that mismatching metaphoric gestures and speech will not be integrated, rather the abstract conflicting metaphoric gestures will be ignored, and participants will look principally to the verbal channel to recover the intended meaning of an utterance.

2 Study 1

2.1 Method

2.1.1 Participants

Study 1 is based upon two independent groups of participants. The first group consisted of 33 participants; the second group had 24 participants.

2.1.2 Materials

A selection of metaphoric gestures was chosen from an extensive naturalistic corpus (see Beattie 2003). The selection of the gestures informed the scripts pro-

duced, where both the speech and the movement was heavily scripted and choreographed. The gestures were then incorporated into three scripts relating to events relevant to everyday student life, including scripts about relationships (Message 1), student debt (Message 2), and work (Message 3). Three different encoders were each given a script and were recorded delivering two versions of each message. In one version, the two incorporated gestures matched the speech (match), in the second version neither of the incorporated gestures matched the speech (mismatch), as shown in Tables 1–3.

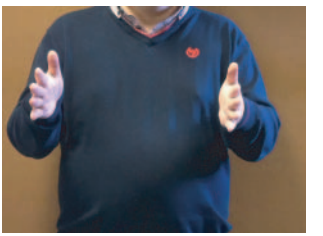
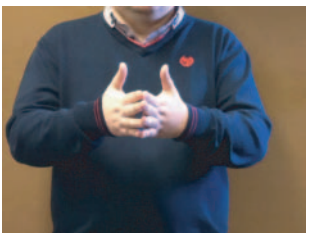
Message 1	**Match**	**Mismatch**
"We're **[very close, really close]**"		
	Metaphoric: Hands are wide apart, palms are facing each other. Hands move rapidly towards each other to an area in front of stomach and stop when they are about an inch apart.	*Metaphoric: Hands are wide apart, palms point towards each other. Hands move rapidly towards each other to an area in front of stomach but do not touch – they stop when they are about six inches apart.*
"I think that I am **[too selective]**"		
	Metaphoric: Hands are wide apart, palms are facing each other. Hands move diagonally to a point at the centre of the chest.	*Metaphoric: The right hand moves up to the chest, palm facing toward the chest. Hand moves in a sweeping motion to the right.*

Table 1: Examples of the matched and mismatched versions of the speech and gesture combinations for message 1.

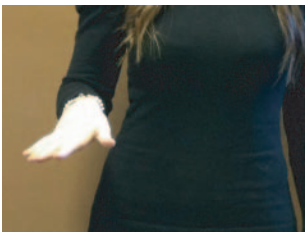
Message 2	Match	Mismatch
"I made a very **[quick decision]**"		
	Metaphoric: Right hand moves rapidly in a downward chopping motion.	*Metaphoric: Right hand moves slowly in a downward motion, palm facing upwards. Hand makes small circular movements as it moves downwards.*
"my level of debt is **[about average]**"		
	Metaphoric: Right hand starts at waist height, palm facing down. Hand moves horizontally to the right.	*Metaphoric: Right hand starts at shoulder height, palm facing down. Hand moves horizontally to the right.*

Table 2: Examples of the matched and mismatched versions of the speech and gesture combinations for message 2.

A questionnaire was devised in which participants were asked to make a series of semantic judgments about each of the three messages. The questionnaire for each message contained target questions which related to specific parts of the message where gestures had been produced alongside the speech. Responses were then marked along a five-point Likert scale. For example, for Message 1 participants were asked, "Is he selective about who he would have a relationship with?" Participants provided a rating from 1 (not at all selective) to 5 (extremely selective).

Message 3	Match	Mismatch
"I set my goals **[really high]"**		
	Metaphoric: Left hand starts off in front of the stomach, palm facing down. Hand moves up so that it is on a level with the shoulder.	*Metaphoric: Left hand starts off in front of the stomach, palm facing down. Hand moves horizontally out to the side.*
"I was prepared to **[go the whole way]"**		
	Metaphoric: Left hand is to the right of the body, palm facing to the side. Hand moves to the left across the body.	*Metaphoric: Left hand is to the right of the body, palm facing to the side. Hand moves towards the left but stops halfway.*

Table 3: Examples of the matched and mismatched versions of the speech and gesture combinations for Message 3.

2.2 Procedure

In the first experimental group, participants were shown the three video clips where the gesture and speech matched. The clips were projected onto a screen in front of the participants and after each clip, they were asked to fill in the questions relating to the video they had just seen. For the second experimental, the same procedure was used, however they were shown the three video clips where the gesture and speech did not match.

Question	Mean Score (matched)	Mean Score (mismatched)	Mann-Whitney U
Did they have a good relationship?	2.79	2.94	U(33,24) = 368.50 n.s.
Do you think he was close to his ex-girlfriend?	2.75	2.94	U(33,24) = 360.50 n.s.
Does he seem quite choosy in finding a girlfriend?	2.75	3.27	U(33,24) = 294.00 n.s.
Is he selective about who he would have a relationship with?	2.67	3.49	U(33,24) = 241.00, $p < 0.01$ Significant result opposite to prediction

Table 4: Mean scores and outcomes of statistical comparisons for Message 1.

Question	Mean Score (matched)	Mean Score (mismatched)	Mann-Whitney U
Does she have a normal amount of debt for a student?	2.46	1.83	U(33,24) = 231.00, $p < 0.05$ Significant result in line with prediction
Does her level of debt seem about average?	2.46	1.75	U(33,24) = 206.00, $p < 0.01$ Significant result in line with prediction
Did she make a fast decision about taking out a loan?	3.67	3.50	U(33,24) = 359.00 n.s.
Was her idea to take out a loan a spur of the moment thing?	4.21	2.92	U(33,24) = 350.50 n.s.

Table 5: Mean scores and outcomes of statistical comparison for Message 2.

3 Results

A series of Mann-Whitney U tests were conducted on the data as shown in Tables 4–6. Table 4 focuses on the analyses deriving from Message 1, Table 5 reports the results from Message 2, and Table 6 reports the results for Message 3. Of the 12 individual comparisons, six were statistically significant in line with the prediction that the presence of a metaphoric gesture-speech mismatch will affect the interpretation of the message. The combined probability of obtaining six signifi-

Question	Mean Score (matched)	Mean Score (mismatched)	Mann-Whitney U
Does she seem driven to achieve goals?	4.39	3.54	U(33,24) = 209.00, p < 0.01 Significant result in line with prediction
Did she set her goals very high when working at the bank?	3.91	2.88	U(33,24) = 189.50, p < 0.001 Significant result in line with prediction
Is it likely that she would do anything to get to the top?	4.21	3.17	U(33,24) = 204.50, p < 0.001 Significant result in line with prediction
Is she prepared to go the whole way in whatever she is doing to show she is a good employee?	4.15	2.92	U(33,24) = 147.00, p < 0.001 Significant result in line with prediction

Table 6: Mean scores and outcomes of statistical comparisons for Message 3.

cant results like this in line with the major hypothesis is itself highly statistically significant ($p < 0.001$). In other words, it seems that not only are mismatches attended to, but furthermore, the content of the mismatch has an influence on how the message is interpreted. For example, when participants were asked, "Does she seem driven to achieve goals?" for the person in Message 3, the participants who were shown the video where the speaker's gesture and speech matched thought she seemed much more driven to achieve goals (Mean = 4.39) than the participants who were shown the video where her gesture and speech did not match (Mean = 3.54). It is interesting to note that all of the results from Message 1 were either statistically non-significant or statistically significant in the opposite direction to what we would expect. This finding will be discussed in greater detail in Section 4.

4 Conclusions

The hypothesis that participants will integrate information from both speech and metaphoric gesture, even in the case of a gesture-speech mismatch has clearly been supported in this first study. Study 1 has demonstrated that gesture-speech mismatches are, at some level, attended to, and that the presence of a mismatch will influence how a message is subsequently interpreted. However, the results from Message 1 were surprising in that only one significant difference was found between the matched and mismatched versions and this was in the opposite direction to what we expected. This either means that the metaphoric gestures for

this particular message were not well chosen or the actor delivering this particular message did so in a way that was either not convincing or he generated the gestures in a way that was too obtuse to be properly interpreted. On reflection, the findings for Message 1 are, in all likelihood, a function of the particular gestures selected for the message. There is, of course, no lexicon to specify the form or meaning of individual metaphoric gestures as they are movements that are generated unconsciously and spontaneously in everyday communication. The same metaphoric gesture in one context may have quite a different meaning in another and there is always the possibility that individuals may interpret the same gesture very differently. Consider one of the utterances used in Message 1 where the speaker says, "I think that I am *[too selective]*" when talking about relationships. Our empirical observations had suggested that the hands narrowing (matched gesture) as shown in Table 7 indicated a degree of selectivity in terms of choosing a partner, whereas the sweeping movement (mismatched) in the second row indicated a lack of selectivity. However, it may be the case that the gesture, with the hands in motion for a greater time in the sweeping movement (our mismatched condition), could indicate the amount of time and effort that went into the process of selecting a partner. This is quite the opposite of what the gesture

	Gesture	Intended Meaning	Interpreted meaning
Matched		Selective	A quick selection that had not been well thought out
Mismatched		Not selective	A process of selection, with the speaker not rushing into finding someone to have a relationship with

Table 7: Interpretations of matched and mismatched gestures.

was intended to represent. In other words, the critical dimension that participants focused on might have been very different to what we, the experimenters, believed to be the critical dimension. While we assumed the positioning of the hands to be crucial, the participants might well have viewed the temporal dimension to be the crucial component of the gesture. Indeed, both dimensions could potentially be relevant to the concept of selectivity. This only further illustrates the importance of careful gesture selection when conducting research on nonverbal communication, as well as highlighting the complexities of abstract metaphoric gesture generation and interpretation.

Of course, so far we have only considered the effects of gesture-speech mismatches on how the underlying message is perceived but there is also the strong possibility on the basis of previous research that such mismatches will also affect aspects of social judgment, including how the speaker is actually perceived. Speakers who display speech-gesture mismatches, for whatever reason, might well be perceived in a more negative light than those who display gestures and speech that match. Is it the case that speakers who display gesture-speech mismatches are less likeable? And does the presence of a gesture-speech mismatch influence how confident people are in the speaker's message? These simple ideas form the basis of the second study.

5 Study 2

5.1 Method

5.1.1 Participants

This study is based upon two independent groups of university students with 20 participants in the first condition and 20 participants in the second condition.

5.1.2 Materials

The metaphoric gestures used in this study were based on detailed observations of how people talk about relationships (see Beattie 2003). From this detailed corpus, five metaphoric gestures that matched the speech and five corresponding gestures that mismatched the speech were selected and incorporated into two scripts about relationships, both delivered by the same female actor. The actor was filmed as she delivered the script to a camera, incorporating the staged gestures. Although the wording was exactly the same for each script, they differed

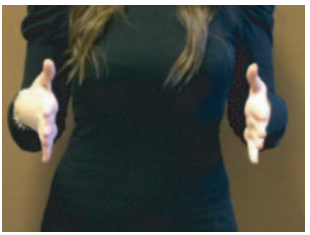
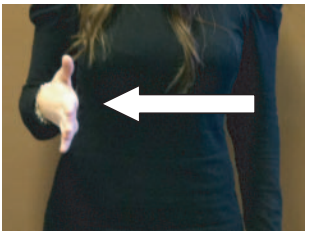
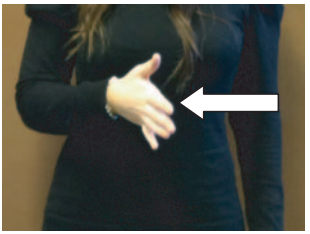
Speech	Match	Mismatch
It just hit me, **[boom],** I fancied him straight away.	 *Metaphoric: [hands move to the side of the head, fingers move apart and hands jolt forwards quickly]*	 *Metaphoric: [hands slowly move to the side of the head, fingers move apart slowly]*
Ever since then we've been **[really close].**	 *Metaphoric: [hands move in front of the body towards each other and stop an inch apart]*	 *Metaphoric: hands move in front of the body towards each other but stop six inches apart]*
I can definitely see our relationship going on for a **[long time]**	 *Metaphoric: [right hand is to the left of the body, palm facing to the side, hand moves to the right across the body]*	 *Metaphoric: [right hand is to the left of the body, palm facing to the side, hand moves to the right but stops halfway]*

Table 8: Examples of the matched and mismatched speech and gesture combinations for Study 2.

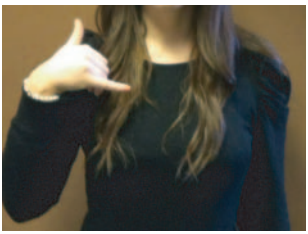
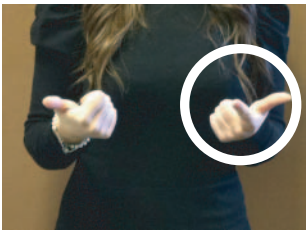
Speech	Match	Mismatch
I only ever ring him **[once].**		
	Metaphoric: [right hand moves towards the temple with the thumb and little finger extended, turns once]	*Metaphoric: [right hand moves towards the temple, both the thumb and little finger are extended, making repeated turning movements]*
I would say in terms of niceness there was **[Paul],** then **[Luke],** then some of **[the proper idiots]** that I regret going out with.		
	Metaphoric: [raises left hand, thumb is extended, index finger on left hand is extended, then right hand rises, thumb is extended]	*Metaphoric: [raises left hand, thumb is extended, raises right hand, thumb is extended, then the index finger on right hand is extended]*

Table 8: (Cont.)

exclusively in the gestures used, so that in one version the gesture and speech matched and in the other version, the gesture and speech did not match (see Table 8). The tone of the script was casual with the intention that it would appear to the receiver as though the speaker had been asked to describe her relationships with her current and previous boyfriends. A questionnaire was created in which participants were asked how much they instinctively liked the person, which was measured on a scale from –3 (extremely dislike) to +3 (extremely like) and were also asked how confident they were that everything the person said was true, which was measured on a scale from –3 (not at all confident) to +3 (extremely confident).

5.2 Procedure

The first set of participants were shown the video clip where the gesture and speech matched. The clip was projected onto a screen in front of the participants and afterwards they were asked to fill in the questionnaire.

The same procedure was repeated for the mismatched version of the clip which was shown to the second group of participants.

Although the classic studies into social judgments about mismatching communications conducted by Argyle et al. (1970) used a within-subjects design, we felt that it was necessary to avoid this type of experimental design as it is not realistic to watch someone in a video clip, make a social judgment about that person and then watch the same person perform the same speech, only this time with different gestures, and then provide a "new" social judgment. The demand characteristics in this situation would be clear to any participants and for this reason, we used a between-subjects design.

6 Results

The analyses revealed that participants intuitively liked the speaker less when the speech and gesture did not match (mean score = –0.90) compared to when the speech and gesture did match (mean score = 1.00), $U(20,20) = 40.5$, $p < 0.002$ (two-tailed). In addition, participants were less confident that everything the speaker said was true when the speech and gesture did not match (mean score = –1.05) compared to the speech and gesture did match (mean score = 0.05), $U(20,20) = 121.5$, $p < 0.005$ (two-tailed), as shown in Table 9.

Question	Mean Score (matched)	Mean Score (mismatched)	Mann-Whitney U
How much do you instinctively like this person?	1.00	–0.90	$U(20,20) = 40.5$, $p < 0.002$
How confident are you that everything the person said was true?	0.05	–1.05	$U(20,20) = 121.5$, $p < 0.005$

Table 9: Mann-Whitney U test for the matched and mismatched scripts.

7 General discussion

Over the past couple of decades, the communicative importance of imagistic gestures has become significantly clearer. In the case of iconic gestures, which represent concrete aspects of everyday meaning, such as size, relative position, speed of motion and direction, we now know that people combine the information conveyed in these gestures quickly, effortlessly and unconsciously with the information in the speech itself (Beattie and Shovelton 1999a, 1999b, 2001, 2002). But until now we have known very little about *how* people deal with the information contained within more abstract metaphoric gestures. Metaphoric gestures are those gestures that represent more abstract aspects of the everyday world; things like uncertainty, freshness, the intimacy of a relationship etc. These abstract concepts, of course, are the stuff of everyday life, yet we knew very little about how people process the information contained within them.

This lack of knowledge prompted the two current studies. Here, two competing hypotheses with quite different predictions were tested. One hypothesis was that individuals would in fact be sensitive to the information contained within metaphoric gestures and, as is the case with iconic gestures, people would combine the information conveyed in the metaphoric gesture with the information in the verbal channel in order to arrive at a more complete representation of a message. The alternative hypothesis was that people may not be sensitive to the information contained in metaphoric gestures, perhaps due to their highly abstract nature and, as a result, the information within them may be largely ignored. The hypotheses were tested by comparing the reactions of participants to messages in which the speech and the accompanying metaphoric gesture either matched or mismatched. Specifically we wanted to know whether the gesture-speech mismatches affected how the messages were perceived? For example, when someone says that they set their goals really high and the gesture indicates a very high goal, are people more likely to understand that this person's goal is genuinely high than when the gesture does not match the speech and does not itself indicate a really high goal? The first study provided compelling support for this hypothesis, demonstrating that the presence of gesture-speech mismatches clearly had an effect on message perception. However, for Message 1 none of the statistical comparisons were significant, except for one which produced significant results in the opposite direction to the hypothesis. Our interpretation of this result is that the particular metaphoric gestures in Message 1 were ill-chosen due to the ambiguity of their meaning. The basic method of gesture selection for each message involved making empirical observations of the gestures generated when people discussed specific themes and then incorporating these gestures into constructed messages (without much exclusion). As context significantly affects the

interpretation of all categories of imagistic gesture, there is always the danger that using this method could lead to the incorporation of gestures without the right properties for that particular message. This seemed to be the case for Message 1 where two different dimensions of the gesture – the positioning of the hands close together (in our view indicating selectivity in the matched gesture) and the amount of time involved in the sweeping gesture (originally thought to indicate lack of selectivity but possibly indicating time invested in selection in the apparent mismatched gesture) could lead to quite different message interpretations. This could well be why Message 1 failed to produce significant results in the predicted direction.

The next empirical question was whether gesture-speech mismatches have any impact on the social judgments made by individuals. The second study found that the presence of mismatches did influence subsequent social judgments, in that participants liked the speaker less and were less likely to believe what the person was saying. Of course, the experimental design was very limited in that there were five gesture-speech mismatches in one version of the message and five gesture-speech matches in the other version. In other words, in the mismatched version, none of the gestures and speech ever matched. So this was, in many ways, an extreme formulation but an extreme formulation necessary in a preliminary investigation of this kind. Whether participants would be as sensitive to one or two mismatches in the general context of gestures and speech that did match remains to be seen.

Importantly, it appears that people seem to sense that there is something not quite right when gesture-speech mismatches are generated, hence the apparent decrease in likeability ratings and message belief ratings found in this study. These results clearly have a number of practical, real-world implications. For example, some researchers have investigated the possible role of imagistic gestures in advertising and have demonstrated the increased effectiveness of advertising that incorporates both speech and gesture when communicating information to the audience (Beattie 2003; Beattie and Shovelton 2005). Based on the findings of this paper, our research highlights the importance of rigorous pretesting of gesture-speech stimuli before their inclusion in an advertising campaign, as the incorporation of an ambiguous gesture can clearly impact on the communicative effectiveness of the "to be conveyed" message. The research may also be of considerable interest to public figures (e.g., politicians), especially those who are attempting to instill confidence in, persuade, or gain the trust of their audience. Despite being highly trained in the importance of nonverbal communication when delivering speeches, politicians should also be aware that the generation of mismatching gesture-speech compounds may have the opposite desired effect, potentially undermining the credibility of the speaker and their

message, as well impacting negatively on the social judgments made by the audience. Of course, more research is required in order to further develop these ideas.

In conclusion, these studies have shown that metaphoric gestures are in fact processed alongside speech. When the metaphoric gesture does not match the accompanying speech, this seems to have a significant effect on how the message is perceived. High goals not accompanied by an appropriately high gesture, for example, are not perceived as that high after all. In addition, it would seem that we are not that favorably disposed to gesture-speech mismatches, at least when they are frequent in a message. This might well mean that we all know intuitively that there is something wrong about gesture-speech mismatches and that things are just not quite right when gesture and speech fail to match in the ways that we might naturally expect.

References

Argyle, Michael, Florisse Alkema & Robin Gilmour. 1971. The communication of friendly and hostile attitudes by verbal and non-verbal signals. *European Journal of Social Psychology* 1. 385–402.

Argyle, Michael, Veronica Salter, Hilary Nicholson, Marilyn Williams & Philip Burgess. 1970. The communication of inferior and superior attitudes by verbal and nonverbal signals. *British Journal of Social and Clinical Psychology* 9. 222–231.

Beattie, Geoffrey. 2003. *Visible thought: The new psychology of body language*. London: Routledge.

Beattie, Geoffrey & Heather Shovelton. 1999a. Mapping the range of information contained in the iconic hand gestures that accompany spontaneous speech. *Journal of Language and Social Psychology* 18(4). 438–462.

Beattie, Geoffrey & Heather Shovelton. 1999b. Do iconic hand gestures really contribute anything to the semantic information conveyed by speech? An experimental investigation. *Semiotica* 123(1/4). 1–30.

Beattie, Geoffrey & Heather Shovelton. 2001. An experimental investigation of the role of different types of iconic gesture in communication: A semantic feature approach. *Gesture* 1. 129–149.

Beattie, Geoffrey & Heather Shovelton. 2002. An experimental investigation of some properties of individual iconic gestures that affect their communicative power. *British Journal of Psychology* 93. 179–192.

Beattie, Geoffrey & Heather Shovelton. 2005. Why the spontaneous images created by the hands during talk can help make TV advertisements more effective. *British Journal of Psychology* 96. 21–37.

Cassell, Justine, David McNeill & Karl-Erik McCullough. 1999. Speech-gesture mismatches: evidence for one underlying representation of linguistic and nonlinguistic information. *Pragmatics and Cognition* 7(1). 1–34.

Church, Ruth Breckinridge & Susan Goldin-Meadow. 1986. The mismatch between gesture and speech as an index of transitional knowledge. *Cognition* 23. 43–71.

Cohen, Doron, Geoffrey Beattie & Heather Shovelton. 2010. Nonverbal indicators of deception: How iconic gestures reveal thoughts that cannot be suppressed. *Semiotica* 182(1/4). 133–174.
Kendon, Adam. 2004. *Gesture: Visible action as utterance*. Cambridge: Cambridge University Press.
McNeill, David. 1985. So you think gestures are nonverbal? *Psychological Review* 92. 350–371.
McNeill, David. 1992. *Hand and mind: What gestures reveal about thought*. Chicago: University of Chicago Press.
McNeill, David. 2000. *Language and gesture*. Cambridge: Cambridge University Press.
McNeill, David & Susan Duncan. 2000. Growth points in thinking-for-speaking, In David McNeill (ed.), *Language and gesture*, 141–161. Cambridge: Cambridge University Press.
Mehrabian, Albert & Susan Ferris. 1967. Inferences of attitudes from nonverbal communication in two channels. *Journal of Consulting Psychology* 3. 248–252.
Mehrabian, Albert & Morton Wiener. 1967. Decoding of inconsistent communications. *Journal of Personality and Social Psychology* 6. 109–114.

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